

This lesson is part of a larger, comprehensive school garden guide called **Minnesota School Gardens: A Guide to Gardening and Plant Science** developed by Minnesota Agriculture in the Classroom in 2013. The entire guide is available at www.mda.state.mn.us/maitc.



Grade

High School

Materials/Preparation

- ☐ Teacher Material A – Plants in Our World – one per teacher
- ☐ Handout A – Surrounded by Plants – one per student
- ☐ Assessment A – Surrounded by Plants – one per student
- ☐ Computers with Internet access and ability to print
- ☐ Colored pencils
- ☐ Notebooks
- ☐ Map of U.S. from the 50states.com website
- ☐ USDA Agricultural Census Data from USDA website <http://www.agcensus.usda.gov>

Fun Fact

It takes about 36 apples to create one gallon of apple cider.



Surrounded By Plants

Minnesota K-12 Academic Standards

Science	9.4.2.1	The interrelationship and interdependence of organisms generate dynamic biological communities in ecosystems.
Science	9.4.4.1	Human activity has consequences on living organisms and ecosystems.
Social Studies	9.3.1.1	People use geographic representations and geospatial technologies to acquire, process and report information within a spatial context.

Summary/Overview

In an effort to connect students with the key idea of plant importance for human life, Surrounded by Plants begins by asking students to survey their home and neighborhood for plant products they encounter in daily life.

Garden Connection

Plants harvest energy from the sun and provide us with many usable products.

Background Information

Plants are vital to all life on Earth. They mean survival. Plants are the base of food for all humans and animals. They can harvest energy from the sun and exchange gas. (Plants use carbon dioxide from the air and convert it into oxygen.) Plants use the energy from sunlight to convert raw materials from the Earth into carbohydrates, fats, and oils. Humans depend on plant materials for food, feed for livestock, fiber, fuel, medicine, aesthetic value, and much more.



Plants are affected by environmental factors, including frost-free periods or growing season, mean average temperature or growing degree days, and rainfall. These factors create unique growing conditions across the United States and throughout the world.

Objectives

- Identify why plants are critical for all life on Earth.
- List plant products found in your everyday world.
- Explain why certain plants are grown in certain regions of the United States.
- Compare and contrast the growing conditions in Minnesota to other areas of the country.

Procedure

Interest Approach

Ask student to think about the many times a day they touch or eat things that come from plant materials. Our world consists of an unimaginable number of products originating with plants. Students are likely touching several as they sit in a chair and take notes in their notebooks. Plants are a major part of daily life in several forms. As a class, make a list of plant products found in the classroom.

Summary of Content and Teaching Strategies

Present and discuss Teacher Material A. Have students brainstorm examples for each of the ways humans use plant material.

Distribute a copy of Handout A to each student. Review the handout and answer any questions. Have students complete the triangle in Figure 1. Part 2 of the activity is for students to research the common growing regions for one crop from each category in Figure 1. The directions instruct students to print off a United States map from the 50states.com website at <http://www.50states.com/maps/print/usamap.htm>. Using this map, students shade growth regions using colored pencils for one crop from each use category. Use a different color for each crop and label the colors in a map legend. Students must incorporate the TODALS (title, orientation, date, author, legend and scale) map basics into the map they create.

For forestry products, the USDA Forest Service database is provided: http://www.srs.fs.usda.gov/pubs/misc/misc_reston.pdf.

Students will need to research medicinal crops separately. The following are common medicinal crops to consider providing to students who need assistance in this category:

- aloe
- Echinacea
- Saint John's Wort
- aspirin
- ginkgo
- castor bean
- hemp

Once Part 2 is completed, students access hardiness zone and precipitation websites to determine the climate correlations to the production regions shaded on their maps. This activity provides an understanding of why certain crops are grown in certain regions due to their dependence upon climate conditions. Find information on hardiness zones in the Teacher Information for Chapter 2 on page 53.

Review/Summary

Have students share their completed maps with the class and explain two things they learned during the activity.

Modifications/Extensions

Get a large wall chart of the United States and have each student add different crops to it in order to summarize crop-growing regions of the United States. Next have students research the social, economic, and ecological risks and benefits of changing a natural ecosystem as a result of human activity. Ask them how these changes might influence crop-growing regions in the future.

Students have researched environmental factors that affect where plants grow. Take this idea a step further and investigate how carrying capacity influences the population of particular plants. After further research, ask students to describe factors that affect the carrying capacity of an ecosystem and relate these to population growth.



Sources/Credits

Adapted from: *Curriculum for Agricultural Science Education (2012) Principles of Agricultural Science – Plant*. [Curriculum materials for secondary agricultural education instruction.] Lexington, KY.

Parker, R. (2010). *Plant and soil science: Fundamentals and applications*. Clifton Park, NY: Delmar. An *Introduction to Plant Science* is found on pages 174-184 and additional information on climate data is found on pages 247-257.

Plants in our world

Plants are vital to all life on Earth for two reasons:

1. Harvesting the Sun: Plants use the energy from sunlight to convert raw materials from the Earth into carbohydrates, fats, and oils.
2. Gas Exchange: Plants use carbon dioxide from the air and convert it into oxygen. The process of food production and gas conversion is called photosynthesis.

Human Value

What are some ways humans use plant material?

1. Food
2. Feed for livestock
3. Fiber
4. Fuel
5. Medicine
6. Aesthetic value

Crop Regions

Certain crops grow in specific regions of Minnesota and the United States. Influencing environmental factors include:

1. Frost free periods (growing season)
2. Mean average temperature (growing degree days)
3. Rainfall

Name _____



Surrounded by Plants

Part 1. Survey Personal Plant Exposure

Survey your home and neighborhood to determine the plant products you are exposed to every day. Complete the lists for the categories of plant products in Figure 1.

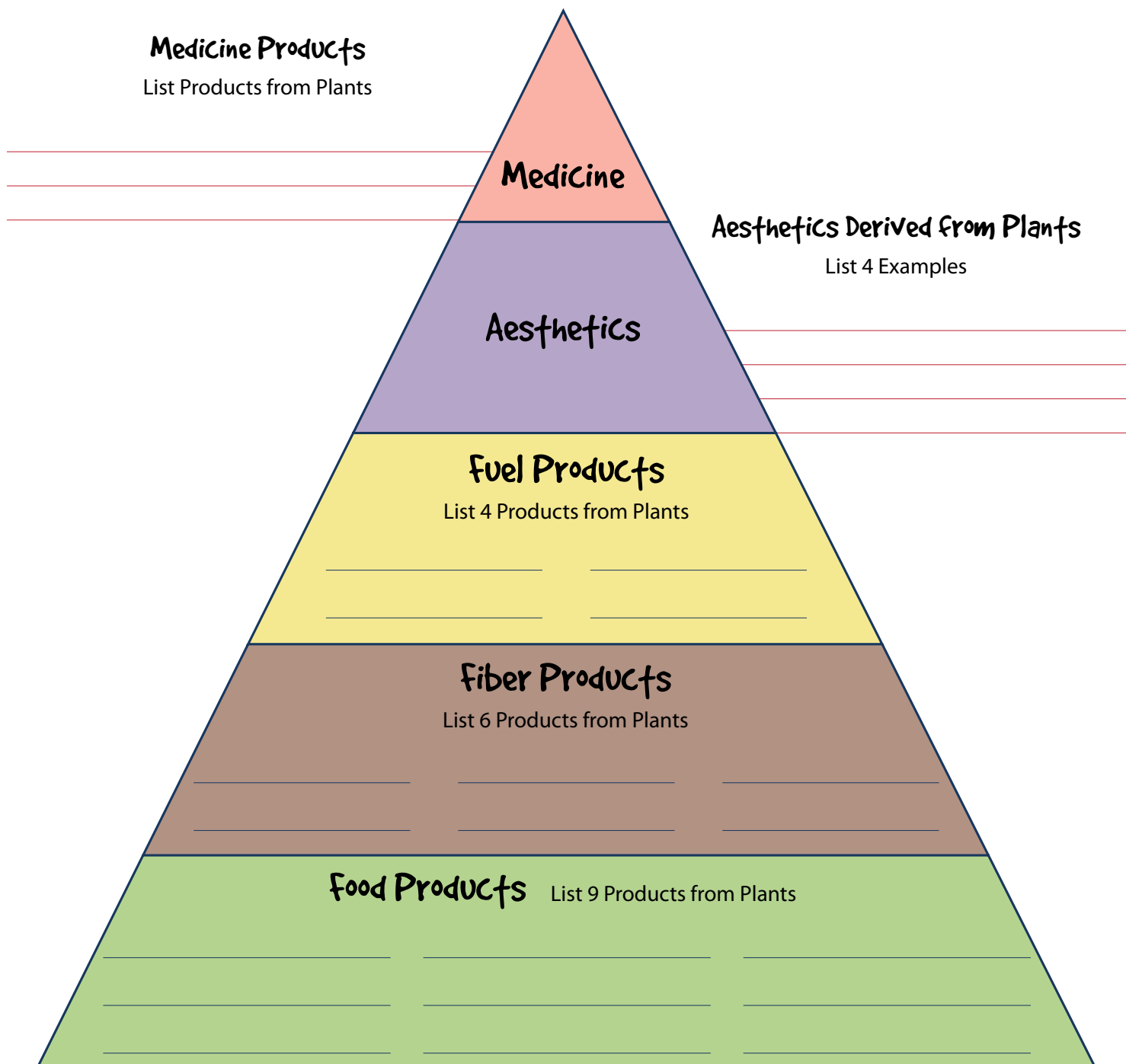


Figure 1. Crop Commodity Triangle

Part 2. Identify Crop Regions

1. Use the USDA Census website to locate the growing regions for ONE CROP from EACH CATEGORY listed in Figure 1.
2. Print off the map of the United States from the 50states.com website at <http://www.50states.com/maps/print/usamap.htm> and use it as the template.
3. Shade in the growing region of each crop using a specific color of pencil to indicate each crop. Include a key on the map to identify which color represents each crop.

For crop growing region, view the USDA 2007 Agriculture Census data:

http://www.nass.usda.gov/research/2007mapgallery/album/Crops_and_Plants/Field_Crops_Harvested/index.html

For information related to forestry products, use the following URL:

http://www.srs.fs.usda.gov/pubs/misc/misc_reston.pdf

Part 3. Identify Growing Conditions

Once your map of crop growing regions is complete, use the following websites to investigate what environmental influences, such as temperature and rainfall, affect plant production.

For plant hardiness zones, view the following website:

<http://www.usna.usda.gov/Hardzone/ushzmap.html>

For rainfall data related to crop regions, see the NRCS website:

<http://www.wcc.nrcs.usda.gov/climate/prism.html>

Conclusion

1. What environmental factors have the greatest effect on determining regions for crop production?

2. What are the predominant crops grown in Minnesota?

3. Explain how growing conditions in Minnesota compare to the southwestern part of the United States.

4. Why do you suspect a large number of cattle and hogs are raised in the Midwest United States?

5. List two plant products that you feel do not fit into any of the categories identified on the pyramid.

Name _____



Surrounded by Plants

1. Explain how plants “harvest” energy from the sun.

2. Name two ways humans use plants.

3. List two environmental factors influencing plants.

4. How do the growing conditions in Minnesota compare to those in other parts of the country?
